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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
WASHINGTON, D. C.
H. H. BENNETT, CHIEF

DETAILS OF CONSTRUCTION
FOR A
TRUCK EXCAVATOR

UNITED STATES DEPARTMENT OF AGRICULTURE
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H. H. Bennett, Chief

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FOR A
TRUCK EXCAVATOR

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Prepared under the Direction of
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A field survey of the work being done by Civilian Conservation Corps Drainage Camps in 1936 disclosed the fact that there was little equipment for use in the removal of silt from small drainage channels. The work was being done by hand, or with teams or tractors and hand scrapers.

At that time several rather unusual homemade machines were seen in operation on small ditches in northwestern Ohio. The machines consisted of two power-driven winch drums mounted on an old traction ditcher or truck chassis. The machine was provided with a wood or angle-iron boom extending from one side of the chassis out over the center of the ditch. In operation the bottom of the ditch was plowed and the loose dirt removed with a board scraper attached to a cable from one of the winch drums. A cable from the other drum worked over a sheave at the outer end of the boom to return the scraper to the ditch for reloading.

In 1936, the Board of Commissioners of Paulding County, Ohio, with the advice and assistance of F. A. Daum, Superintendent of the Defiance Ohio Camp, constructed such a machine utilizing a commercial gasoline-engine-driven hoist unit. When this camp started using a crescent or scoop scraper with the machine, the CCC enrollee operator, Chuck Kimberly, made a hook-up of the scraper return cable passing through a small pulley, in such manner as to permit power dumping. This development speeded up the work considerably by eliminating the necessity for men to follow the loaded scraper up the ditch bank and dump it by hand.

The principle involved in these machines appeared to be a step forward from the use of tractors, and experimental work has been carried on to improve and standardize the design. The details of design and bill of materials for the machine are presented in this report.

The machine has been designed as a complete attachment which can be mounted on or easily removed from practically any make of truck at least 1-1/2 ton or larger. For light cleanout work where only soft silted-in material is to be removed the 1-1/2 ton chassis is satisfactory. For all around use and especially for work in heavy clay soil a heavier chassis is recommended.

Cost of the attachment is estimated at \$800 to \$1,000. Use of a second-hand hoist unit will reduce this figure considerably. Net weight of the attachment with hoist is 3,000 to 3,500 pounds. Tests have shown that the machine will handle 10 to 15 cubic yards per hour. For operation the following crew is needed: Truck driver; hoist operator; and one or two men to guide the scraper while it is being filled.

This type excavator is superior to tractors and scrapers in that hand dumping and hand return of scrapers is eliminated. The machine can easily be moved from one job to another. Investment cost is low and construction is not complicated. The truck is available for regular work by removal of the attachment.

The excavator is primarily a maintenance machine and its use is limited to the smaller channels. It works to best advantage where the bottom width does not exceed 3 feet, where the depth is not more than 6 feet, and where the quantity excavated does not exceed 40 to 45 cubic yards per 100 feet of length. When the top width is more than 30 feet it may be necessary to work from both sides of the ditch.

The photograph shows one of the machines in operation, and sheets 1 to 7, inclusive, are drawings of the various parts of the machine.

Important

The description of the machine and accompanying drawings should be carefully studied before purchasing any material. The size and make of either the hoist unit or the truck to be used may make it necessary to deviate somewhat from the standard plans.

Hoist Unit

A unit of the following specifications is recommended:

1. Double drum, with 14 to 20 h.p. gasoline engine
2. Bare drum rope speed: 95 to 105 feet per minute
3. Maximum length: 78 inches
4. Maximum width (not including levers or easily removable parts): 44 inches unless main frame of excavator attachment is constructed wider than shown.
5. Controls located on the right hand side of the unit as determined by viewing the unit from the rear or engine end
6. Clutch type power take-off on engine
7. Advisable that the drums revolve in opposite directions, i.e., so that the cable will wind in over the top of the rear drum and bottom of the front drum.

8. Foot brakes and manually operated pawl and ratchet device.
9. Maximum weight: 1800 pounds for 1-1/2 ton truck.

Construction and Assembly

Main Frame - Sheets 2 and 3.

Before cutting the material for the main frame, determine whether or not the hoist unit to be used can be mounted inside the angle-iron standards, 7, with the standard clearance of 44 inches when 48-inch cross members are used. If the hoist cannot be mounted within this width it will be necessary to increase the length of the cross members, 2, the upper cross member, 14, and the front frame braces, 5. Do not make the frame wider than necessary or the boom tie-back cables, 85 and 86, will interfere with the operator. The frame is designed to be mounted crosswise of an 87-inch width truck bed. The boom end of the frame should be mounted flush with the left side of the bed to allow approximately 5 inches overhang at the right side as shown on sheet 7. The length of the frame may be changed if the unit is to be mounted on a truck bed or platform of other width.

After deciding upon the size of frame to be built the material should be cut to the required lengths. Lay out the side members, 1, and cross members, 2, on a level floor, square up the frame and hold the members in position for welding by using C-clamps. If the base of the hoist unit has already been drilled for bolting down it may be advisable to shift the position of center or rear cross member so that the hoist can be fastened down without drilling additional holes in the base of the hoist unit.

The holes for the cable roller shaft, 17, and boom foot bolts, 90, should be drilled after 3, 6, 11, 12, and 16 have been welded together to insure proper alignment. Make up the cable roller assembly as shown and use the roller as a spacer when clamping the boom foot support assembly, 3, 6, and 11, into position for welding to the front cross member. Next cut 5 to fit and weld into position.

With the base completed, clamp the angle iron standards, 7, and head plate, 8, for each side into position and weld all joints. The small holes should be drilled and the large hole to permit fitting of 14 should be cut in the head plates before they are welded in position. Extension of each end of the pipe, 14, through holes cut into the head plates as shown is recommended rather than a butt-weld of the pipe to the plates.

After the standards and head plates have been welded into position, make up the lift sheave frame, 9, slip it over the pipe, 14, and weld the guides, 13, in place. Spread the tops of the standards and enter the ends of the pipe, 14, into the head plates, square the top of the frame, weld the pipe to the head plates and attach the braces, 10.

The exact length of the boom transport brace, 22, can best be determined after the machine has been mounted on the truck and the transport position of the boom is known.

Important - Check alignment and position of members frequently while welding to guard against warping.

Boom - Sheet 3.

Cut the flanges of the boom side pieces, 25, as indicated for each end of the boom, weld in the filler plates, 29 and 30, and drill the holes for the sheave shaft and boom foot bolts. In the average shop it will be found advisable to secure the proper angle for the bonds at the foot of the boom by bolting the boom into position in the main frame. At the head of the boom use the sheave with a 28 gauge shim between each side of the sheave and the inside of the boom as a spacer and clamp the side pieces together. The flanges may then be welded together at the bonds. Before welding in the crosspieces line up the side pieces as straight as possible using C-clamps and scrap material to hold them in position.

Considerable care must be exercised in construction of the sheave guard, 31, at the head of the boom so that the cable will not foul or be cut. Rolling the lower end of the guard strap around a $3/8$ " bolt forms an eye which holds the guard in place and also acts as a spacer to permit adjustment of sheave clearance by the use of flat washers as shims on the $3/8$ " x 5" bolt through the end of the boom. Force the tie-back cable eyes, 33 and 34, as shown. Cut stiffeners, 27 and 28, and weld them in position as shown.

Counterbalance - Sheet 4.

Cut the channel iron side members, 40, and cross members, 41 and 42, to fit, hold in position with clamps and weld joints. Cut 43, 44, and 45, forge 46 and 47, and weld them in position. The barrel stops, 45, should be spaced so as to allow $1/8$ " clearance between stop and end of barrel.

Scraper - Sheets 5 and 6.

The adjustable position cut-away handles are designed to permit the scraper to be dumped completely over without interference with the haulback cable. The scraper steps, 57, serve as auxiliary handles for setting the scraper into digging position and also as treads for applying pressure with the foot while the scraper is filling.

The fitting up of two scrapers is advised: One with the straight blade, 53, and heavy digging teeth, 55, and the other with the triangular toothed blade, 54. For soft soil conditions where teeth of any type cause the scraper to dig in too deeply use the straight edged blade with the teeth removed. For hard clay soil where maximum penetration is desired use the straight edged blade with heavy digging teeth. For green sod and cat-tail growths use the triangular toothed blade.

The triangular toothed blade is difficult to sharpen due to the irregular edge and if the edges become dull, dry sod, roots, and heavy weeds collect between the bases of the teeth. A medium carbon steel should be secured for this type blade and the cutting edges may be cut with the cutting torch held at an angle and the edge finished with grinder and file.

Spring steel (annealed) should be used for the straight edged blade and heat treatment after grinding and drilling is advisable. The heavy digging teeth should be cut or milled from high carbon steel and heat treated after drilling. If the single block, 61, cannot be purchased locally it may be made by turning out a grooved sheave 3" in diameter, 3/4" thick, and 3/8" to 7/16" bore. Make up a shell of 1/4" flat steel and an attachment eye or loop of 1/2" round. The 1/2" swivel shackles, 62, can be secured from marine or wire rope supply houses. The swivel shackles are more desirable than plain shackles to prevent twisting of the cables.

Anchorage to Truck - Sheet 7.

The main frame of the attachment should be located on the truck bed so that the U-bolt clamps, 75, and the diagonal tie rods, 74, will not interfere with the floor beams, spring hangers, etc. Drill the 9/16" holes for the upper ends of the tie rods through the crossmembers and bed floor as shown. The two through the front crossmember are at an angle of about 33 degrees and at the rear crossmember an angle of about 22 degrees depending upon the make of truck.

The U-bolt clamps, 75, tie the excavator attachment frame to the truck frame. If the floor beams are of light construction it

will be advisable to insert 2 auxiliary floor beams directly beneath the side pieces of the excavator attachment frame. If channel iron is used the 3/8" bolts which hold the excavator frame to the floor should be long enough to extend through the excavator frame, the floor, and on through the upper flange of the auxiliary floor beams. A long bearing plate should be provided between the lower edge of the auxiliary floor beams and the top edge of the wood sill.

The hardwood blocks, 73, are essential to eliminate spring action while at work when truck chassis of 2 ton size or smaller is used. These blocks must be removed for travel on highways to prevent damage to the chassis. The channel iron frame insert, 70, is necessary to strengthen the frame. Two lengths of angle iron welded together to form a channel iron effect may be substituted for standard channel iron when the truck frame is tapered or is of odd width.

The hoist unit should be mounted in place in the excavator frame before the wood blocks are cut to the proper length. The truck springs should carry practically all of the load, the blocks serving only to eliminate spring action while at work. Splitting of the wood may be prevented by the use of 1/4" draw belts through the blocks.

Erecting the Boom:

Bolt the foot of the boom to the frame using 1" by 4-1/2" steel bolts, 90. Do not draw these bolts tight until the boom is up into working position. Block up the outer end of the boom so that it is about 4 feet off the ground. Pass the scraper return cable, 66, over the lift sheave, 20, then out to the end of the boom and over the boom sheave, 35, by removing the sheave shaft. Take the end of this cable back on the under side of the boom and attach it to the right boom stiffener, 28. Place the tie-back cable eyes, 33, on the ends of the shaft using flat washers and cotter pins. Attach one end of each primary tie-back cable to the cable eyes, 33, using wire rope thimbles and clips. Raise the boom slightly above working position (an angle of approximately 26 degrees with the horizontal or a vertical distance of about 15 feet from the boom sheave shaft to ground level on a 42" height truck) by engaging the scraper return cable drum clutch. Hold the boom in this position by dropping the pawl into the ratchet and attach the lower end of the cables, 85a and 85b, to the head plates, 3, using 5/8" shackles, thimbles, and cable clips. A 5/8" turnbuckle must be inserted in one of the cables, preferably the one on the left, so that both primary cables may be adjusted to the same tension. Now raise the boom slightly to release the locked pawl and let the boom down slowly into the cables by using the foot brake on the hoist drum. Adjust the cables to the same tension and install the secondary tie-back cables, 86, using a 1/2" turnbuckle at the frame end of each one of these cables, and a

1/2" shackle at the boom end. Be sure that the boom is supported primarily by the two longer cables and then tighten the turnbuckles in the secondary cables only tight enough to remove the slack. After the first few hours' operation it will be necessary to readjust all turnbuckles. Attach the scraper in the manner shown on sheet 6.

To lower the boom reverse the above operation, except that it will not be necessary to loosen any cable clips; merely disconnect the shackles at the lower ends of the cables.

Important - Never attempt to raise or lower the boom without first passing the scraper return cable, 66, over the lift sheave, 20. If this is not done, the boom will be distorted.

Raising the Counterbalance:

The counterbalance support is hinged to the main frame by 1" x 2" steel bolts, 91. Insert these bolts and block up the counterbalance frame so that it is parallel with the ground. Now fit and adjust the two support cables, 87a and 87b, to hold the frame in this position. Use a 1/2" turnbuckle in one of the cables to provide adjustment for uniform cable tension.

If it is desired to fill the barrel on the ground the frame and barrel may be raised into working position by passing the scraper pull cable, 65, over the lift sheave, 20, and attaching the end of it to the center cable eye, 46, on the counterbalance frame. Engage the pull drum clutch and hold the counterbalance in a raised position while fastening the upper ends of the cables to the head plates, 8, using 1/2" shackles.

Ordinarily the drum is filled with water but during freezing weather a calcium chloride solution is used. About 3 lbs. of 75% Solvay CaCl_2 per gallon will lower the freezing point to $12\text{-}1\frac{1}{2}^{\circ}$ below zero.

Transporting the Machine:

Disconnect the scraper, empty the counterbalance drum and remove it from the frame. Fold up the counterbalance frame and fasten it in a vertical position by use of the two braces, 23. Lower the boom and take out the foot bolts. Lay the boom along the left side of the truck as shown on sheet 1 and bolt it down in this position by brace, 22, and brackets, 71 and 72. Remove the wood blocks, 78.

Operation

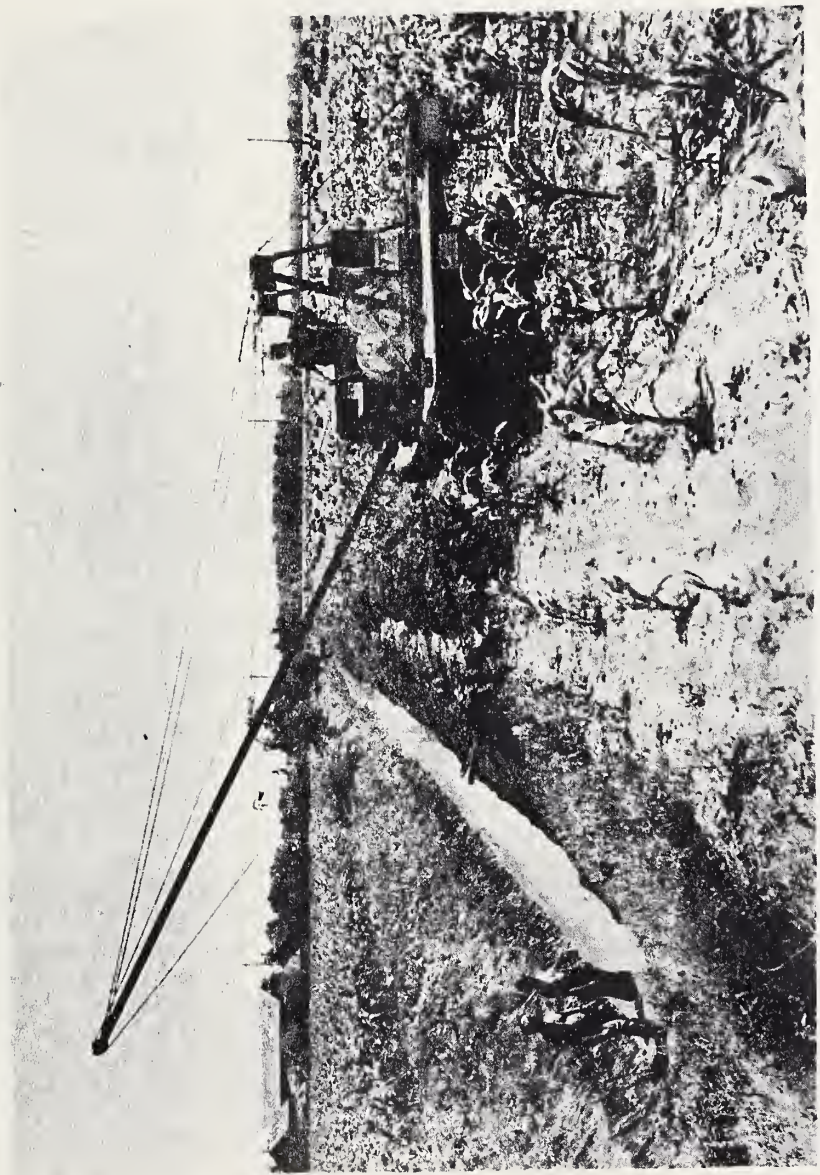
The machine may be used on either side of the ditch by traveling either forward or backward as may be necessary. Drive the truck alongside the ditch so that the end of the boom is directly over the point in the ditch where the scraper is to be started. By applying the brake on the scraper return drum, hold the scraper suspended above the ditch at a height convenient for the one or two scraper men to reach, and guide the scraper while it is dropped into filling position. Then slowly engage the pull drum clutch and load the scraper while it is being guided by the men or men in the ditch. At first it may be necessary to pull the scraper up to dumping position, disengage the pull drum clutch and hold down on the pull drum brake; then engage the scraper return drum clutch to dump the scraper, release the brake on the pull drum and the scraper will be returned to filling position. After becoming familiar with the controls the operator will have no difficulty dumping the scraper while it is still being moved along by the pull cable and it will not be necessary to use the brake except to hold the empty scraper suspended while it is being guided over the filling position.

To maintain good alignment and as an aid to starting the scraper, a small trench should be dug along the bank opposite to the machine on a line at which the scraper is to be started. When working in heavy clay soil there may be a tendency to overturn the truck when the scraper is overloaded. In such cases the dirt should first be loosened with a plow. It will be necessary for the hoist operator to continually guard against overturning by always being ready to release the pull drum clutch and free the scraper when overloaded or in encountering rocks and heavy roots. The operator also has the responsibility of being sure that men in the ditch are in the clear before swinging the empty scraper back out over the ditch.

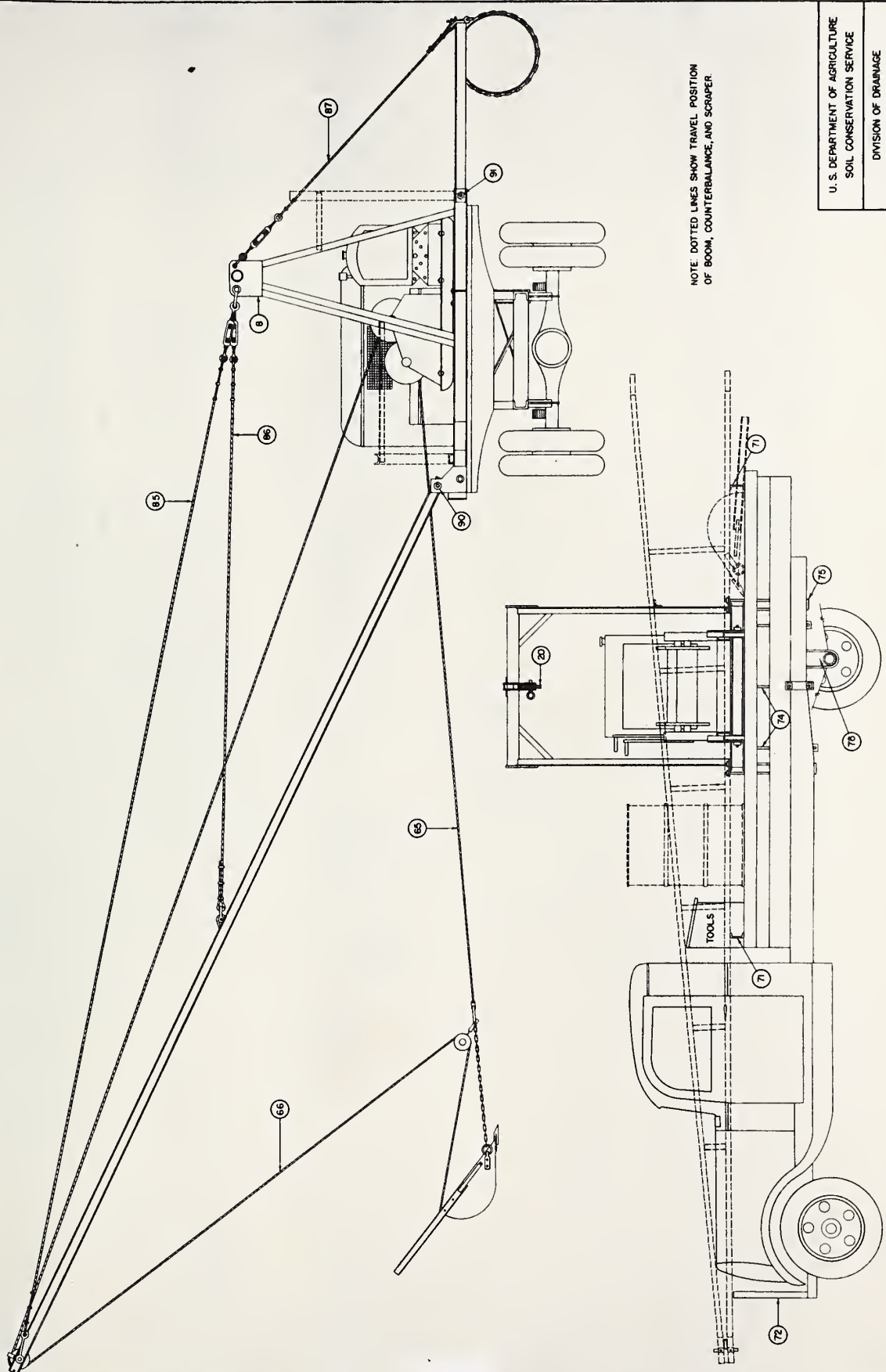
Remember that men are working under the boom and close to cables under considerable tension. Be sure that the tie-back cables, turnbuckles, and shackles are in first class condition at all times. Always use forged steel shackles, never use malleable iron clevises.

Maintenance

Follow the manufacturers' recommendations for lubrication and adjustment of the hoist unit. Grease the cable roller, boom sheave, and scraper dumping pulley at least twice daily. Check the boom and counterbalance support cables daily to maintain uniform cable tension and keep all shackle pins securely fastened. Replace badly worn pull cable to safeguard against accidents due to breakage.

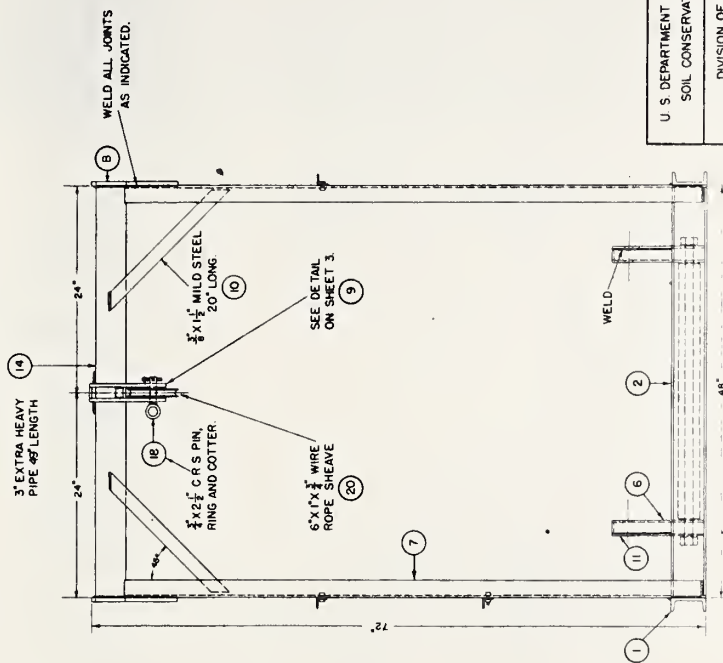
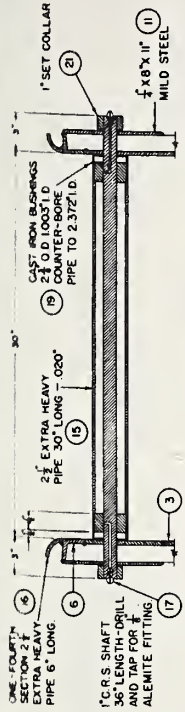
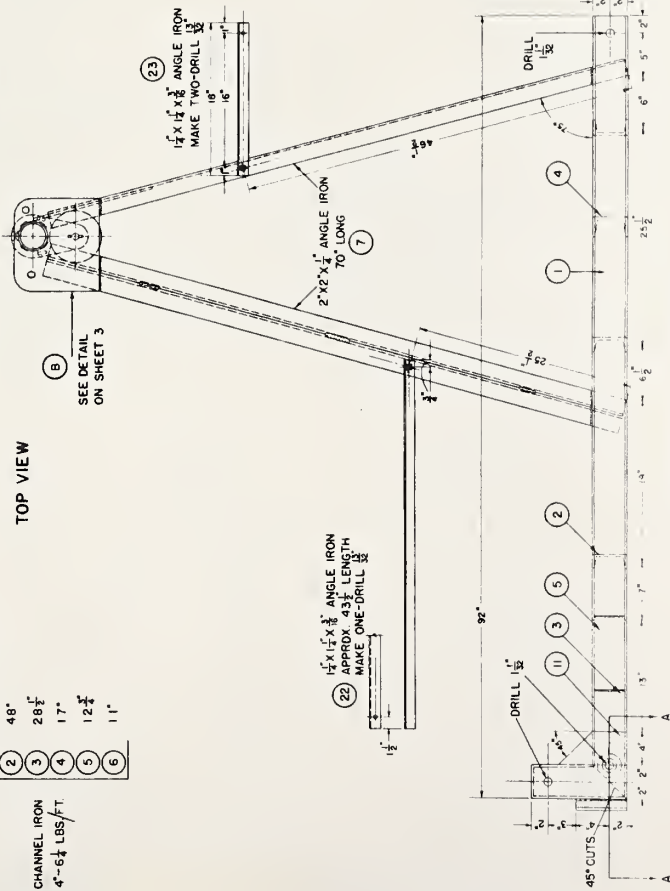
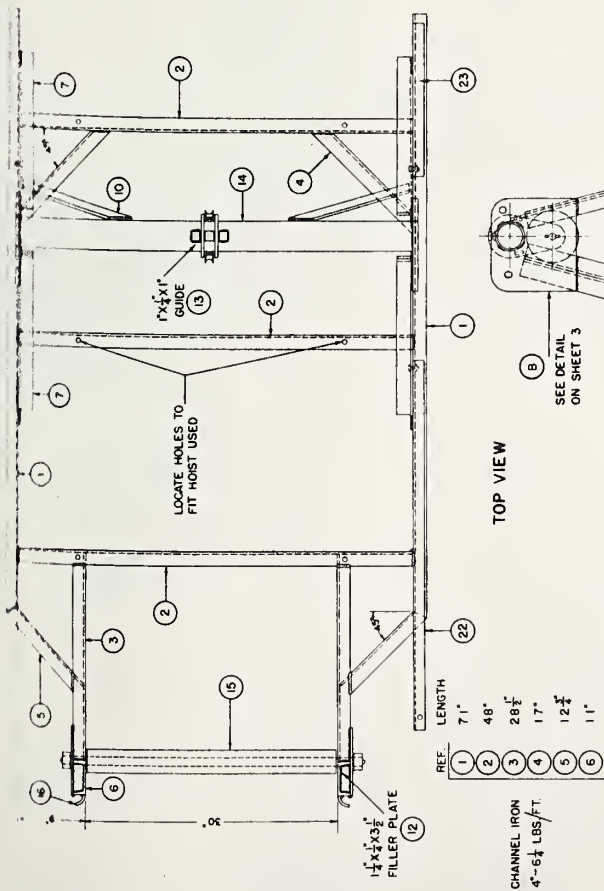


Truck Excavator in operation on drainage ditch in Ohio.

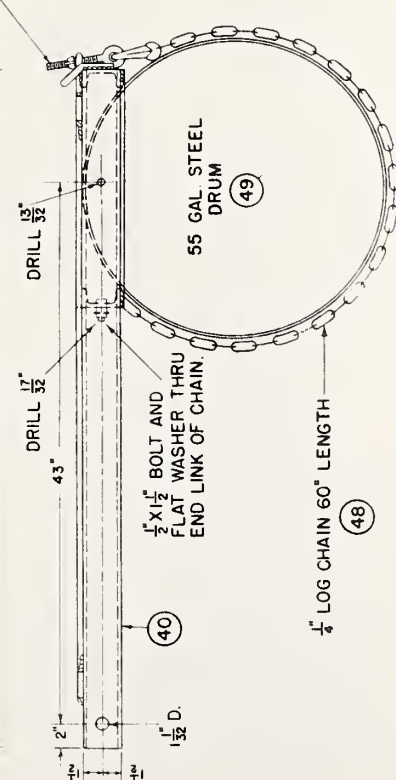
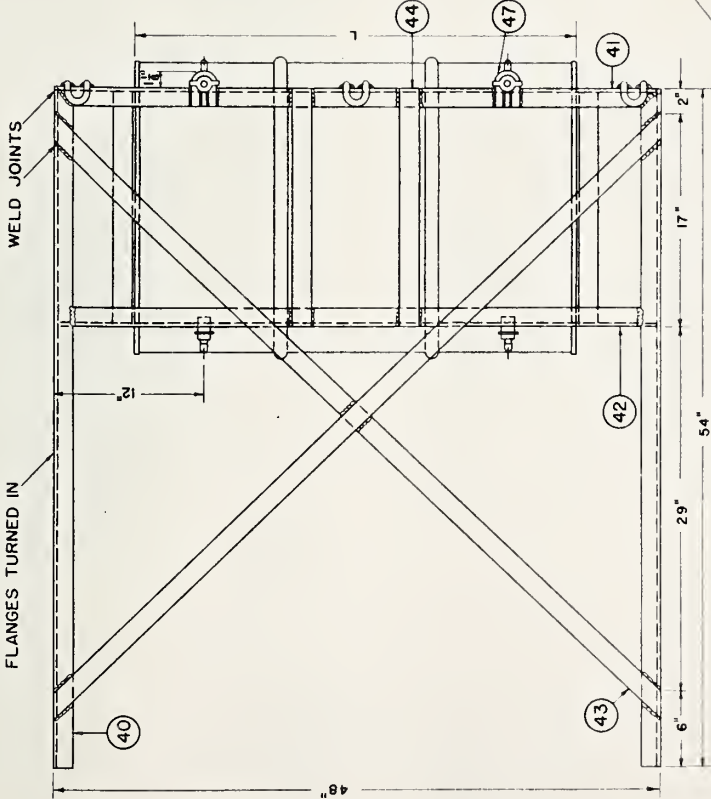


NOTE: DOTTED LINES SHOW TRAVEL POSITION OF BOOM, COUNTERBALANCE, AND SCRAPER.

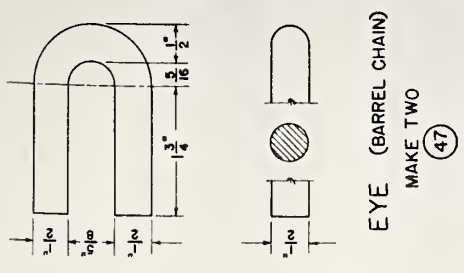
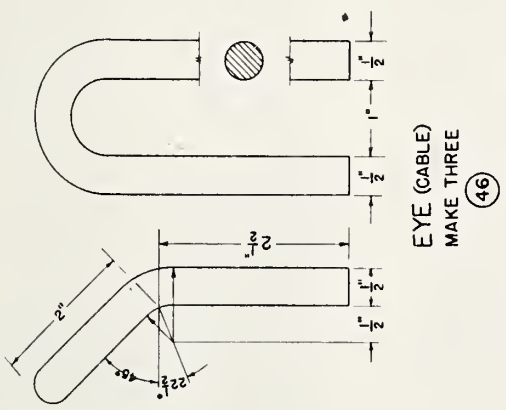
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
DIVISION OF DRAINAGE	
TRUCK EXCAVATOR	
Designed By D. A. Miller	June 20, 1939
Drawn By D. A. Miller	
Traced By Mrs. A. Davies	
SHEET 1 OF 7	



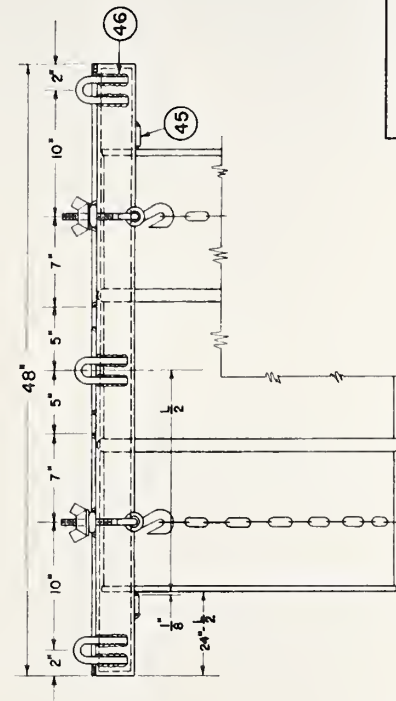
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
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TRUCK EXCAVATOR	
Designed By D. A. New	June 20, 1939
Drawn By D. A. New	
Traced By Mrs. A. D. New	
SHEET 2 OF 7	



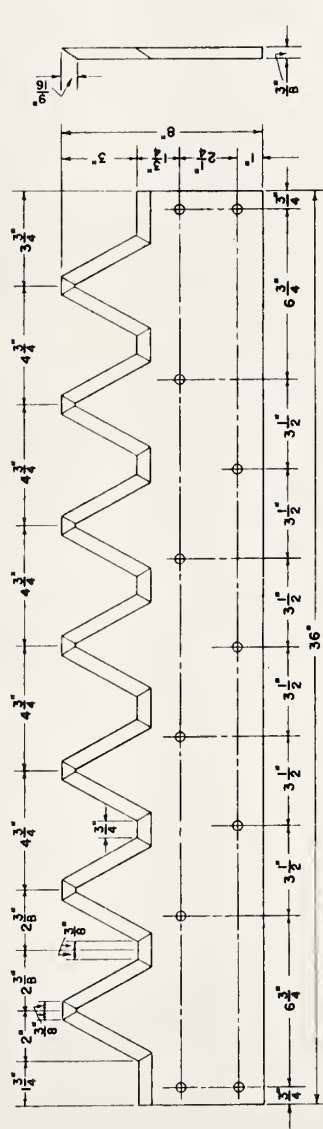
COUNTER-BALANCE ASSEMBLY
 MAIN FRAME OF 3"-4.1" CHANNEL IRON
 BRACING AND TIES OF 1 1/2" X 3/8" MILD STEEL.
 L REPRESENTS LENGTH OF DRUM.



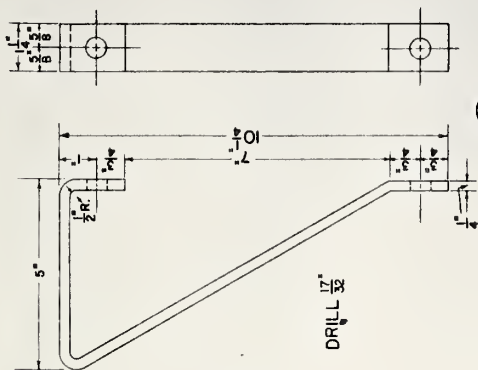
1/2" X 6" EYE BOLT, WING-NUT, FLAT WASHER,
 AND 5/16" GRAB HOOK.



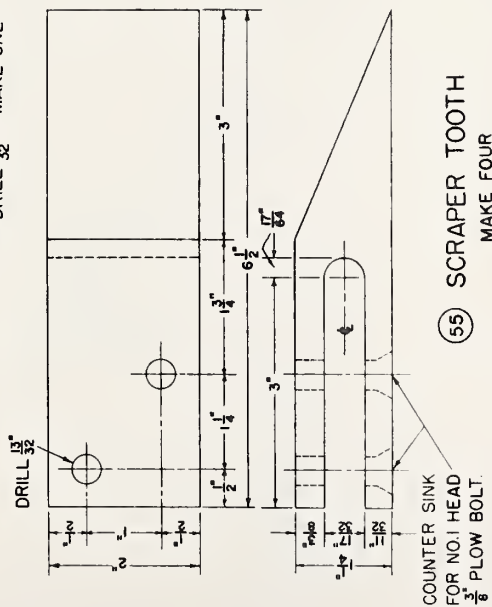
U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
DIVISION OF DRAINAGE	
TRUCK EXCAVATOR	
Designed By C.A. Hiler	June 20, 1939
Drawn By D.A. Hiler	
Traced By m. A. Davis	
SHEET 4 OF 7	



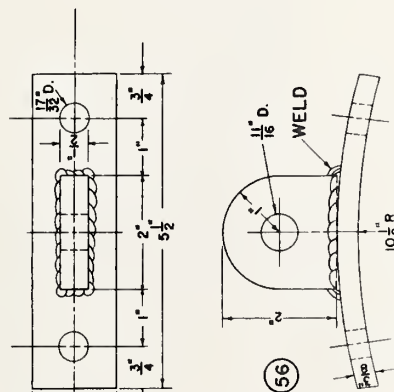
DRILL $\frac{13}{32}$ — MAKE ONE



57
SCRAPER STEP
MAKE TWO

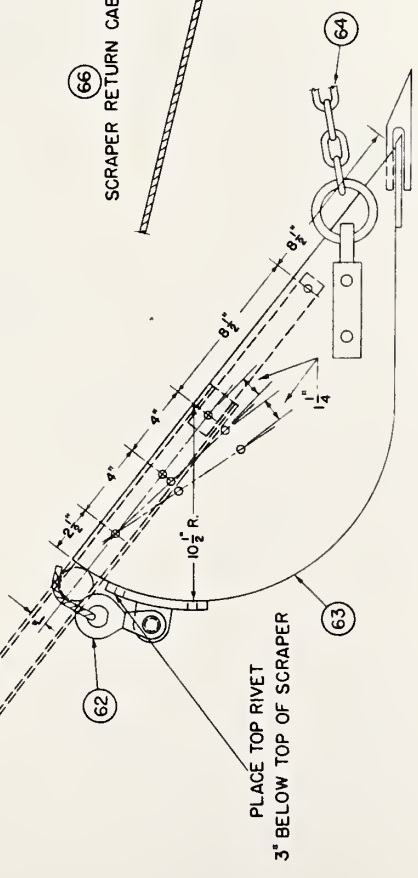
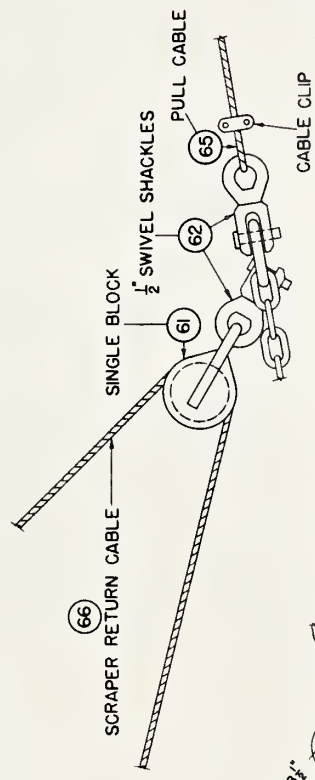
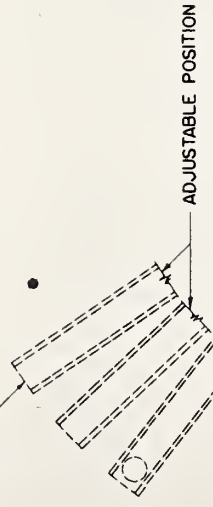
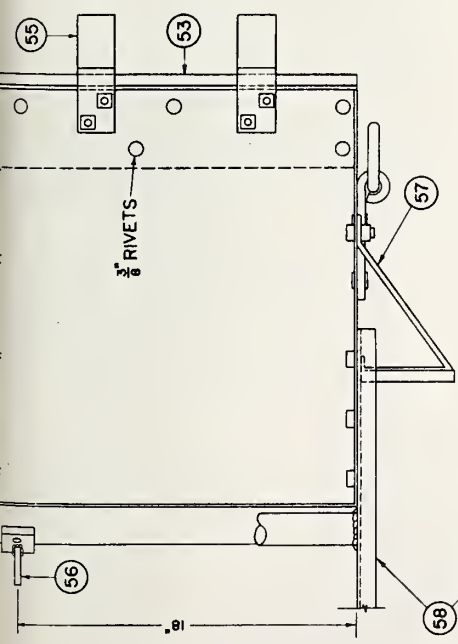
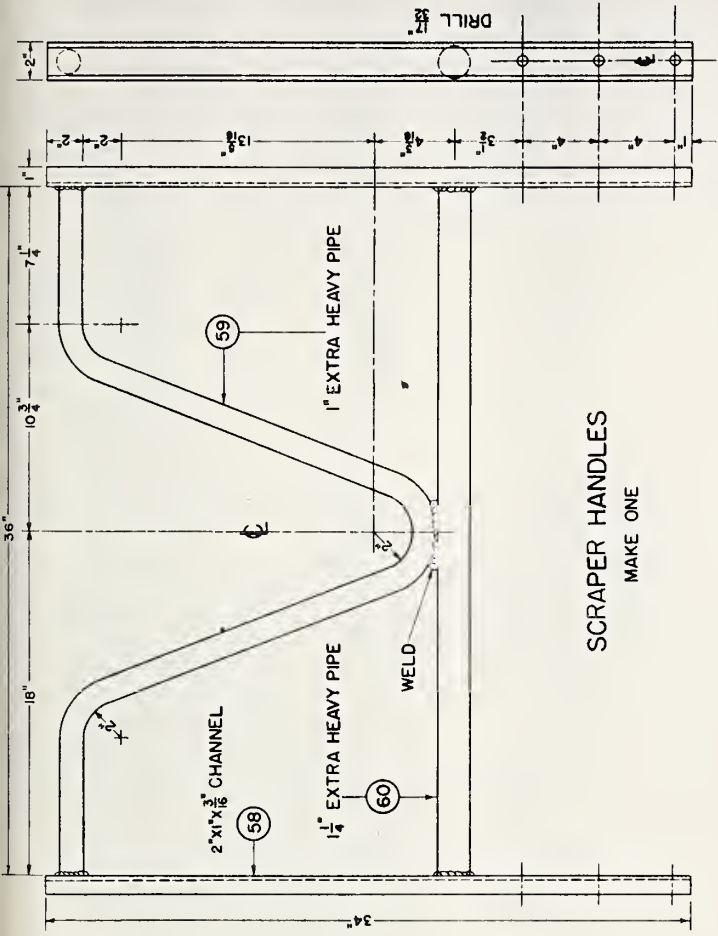


55 SCRAPER TOOTH
MAKE FOUR

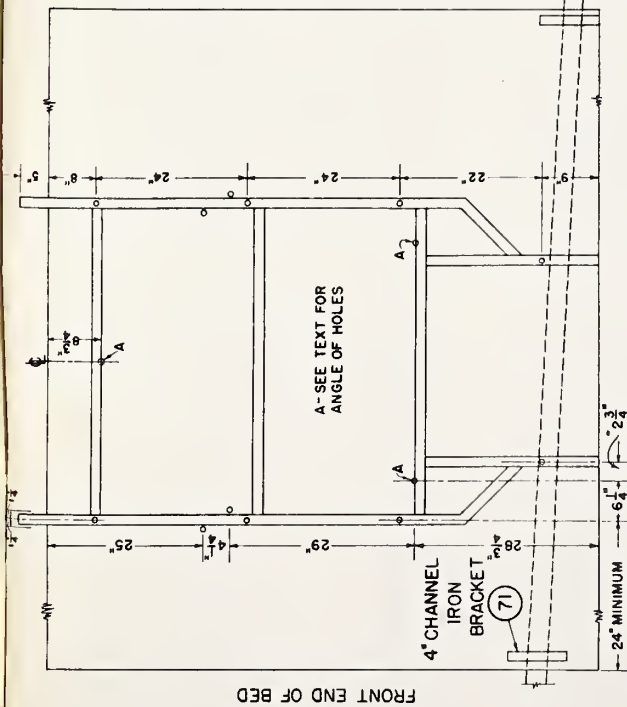


HAUL-BACK CLIP
MAKE ONE

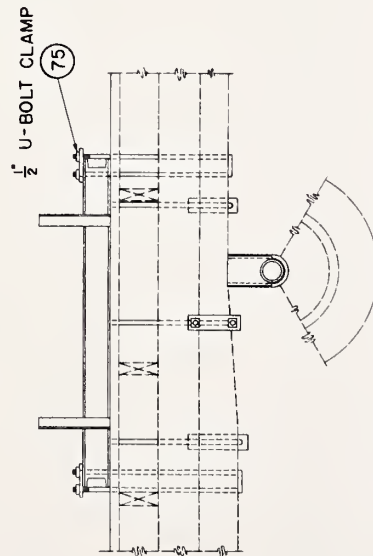
U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
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TRUCK EXCAVATOR	
Designed By D.A. Her	June 20, 1939
Drawn By D.A. Her	
Traced By Wm A. Dwyer	
SHEET 6 OF 7	



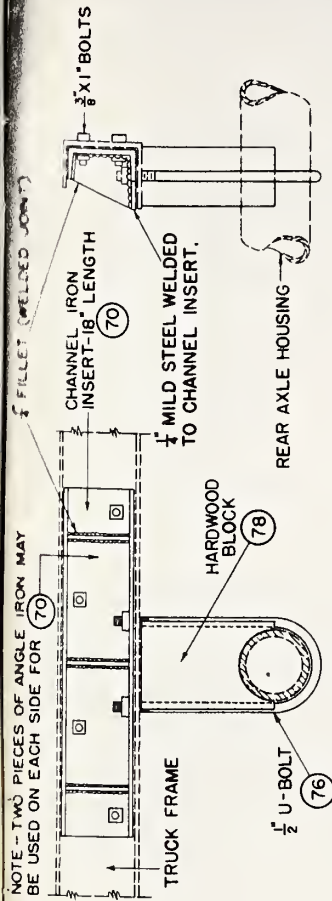
SCRAPER ASSEMBLY



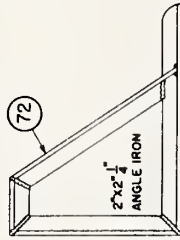
LOCATION OF HOLES IN TRUCK BED AND BASE OF MAIN FRAME
DRILL HOLES FOR DIAGONAL TIE BOLTS AND U-BOLT CLAMPS $\frac{9}{16}$ ". ALL OTHER $\frac{13}{32}$ ".



FRAME TO TRUCK ANCHORAGE
LEFT SIDE VIEW

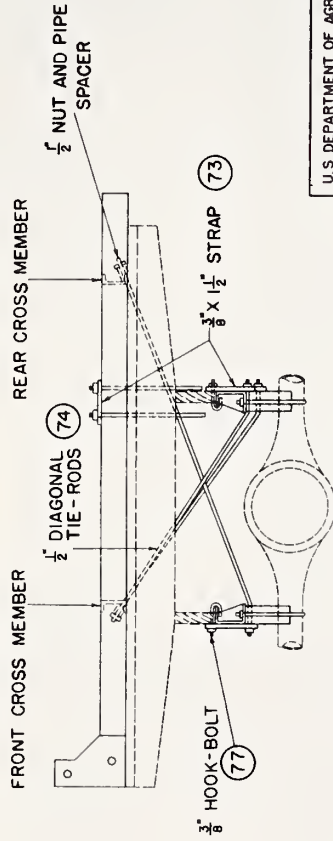


DETAIL OF FRAME TO REAR AXLE BLOCKING.
MAKE 2



BUMPER BRACKET
(BOOM) MAKE 1

NOTE: EXACT DETAILS OF PARTS FOR FRAME ANCHORAGE WILL DEPEND ON MAKE OF TRUCK USED.



REAR VIEW

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
DIVISION OF DRAINAGE	
TRUCK EXCAVATOR	
Designed By O. A. Iser	June 20, 1939
Drawn By O. A. Iser	
Traced By Wm. A. Darrow	
SHEET 7 OF 7	

Bill of Materials for Truck Excavator

Main frame - sheet 2

Part name and number		Material	Amount required
Frame side members	1	4"- 6-1/4 lb. channel	two - 71 inches
Frame cross members	2	"	three - 48 "
Frame extension	3	"	two - 28-1/2 "
Frame brace -- rear	4	"	two - 17 "
Frame brace - front	5	"	two - 12-3/4 "
Frame front upright	6	"	two - 11 "
Frame standards	7	2" x 2" x 1/4" angle	six - 70 "
Boom transport brace	22	1-1/4" x 1-1/4" x 3/16" angle	one - 43-1/2 "
Counterbalance transport brace	23	"	two - 18 "
Head plate	8	1/2" x 10" steel plate	two - 11 "
Lift sheave frame	9	3/8" x 5" flat	two - 9 "
Standard brace	10	3/8 x 1-1/2" flat	two - 20 "
Front upright plate	11	1/4" x 8" flat	two - 11 "
Filler plate	12	1/4" x 1-1/4" flat	two - 3-1/2 "
Sheave frame spacers	(9)	1/4" x 1" flat	three - 1-1/8"
Sheave frame guides	13	"	two - 1 "
Frame cross member (upper)	14	3" ex. hvy. pipe	one - 49 "
Cable roller	15	2-1/2" ex. hvy. pipe	one - 30 "
Cable guide	16	2-1/2" ex. hvy. pipe (1/4 section)	two - 6 "
Roller shaft	17	1" C.R.S. shafting	one - 36 "
Lift sheave pin	18	3/4" C.R.S. shafting	one - 2-1/2 "

Part name and number	Material	Amount required
Roller bushing	19 Cast iron round, 2-3/8" diam.	two - 1-1/2 inches
Lift sheave	20 6" x 1" wire rope sheave	one - 3/4" bore
Set collars	21 1" bore	two
Sheave pin ring	(18) 1/4" x 1-1/2"	one
Alomite fittings	1/8"	two
Cotter pin	1/8" x 1-1/2"	one
Machine bolts	3/8" x 1"	six
Lock washers	3/8"	six

Boom - sheet 3

Side channels - R and L	25	3" - 4.1 lb. channel	two - 25 feet
Boom cross piece	26a	"	one - 22-1/2 inches
Boom cross piece	26b	"	one - 19-1/4 "
Boom cross piece	26c	"	one - 16 "
Boom cross piece	26d	"	one - 12-3/4 "
Boom cross piece	26e	"	one - 9-1/2 "
Boom cross piece	26f	"	one - 6-1/4 "
Boom cross piece	26g	"	one - 3 "
Boom stiffener - L	27	1/4" x 4" flat	one - 9-1/2 "
Boom stiffener - R	28	"	one - 9-1/2 "
Head plates	29	1/4" x 2-1/2" flat	two - 8 "
Foot plates	30	"	two - 6 "
Sheave guard	31	1/4" x 1" flat	one - 16-1/2 "
Sheave shaft	32	1" C.R.S. shafting	one - 7-1/4 "

Part name and number	Material	Amount required
Tie-back cable eye - primary 33	5/8" round	two - 16 inches
Tie-back cable eye - secondary 34	1/2" round	two - 11 "
Drum sheave	35 Phosphor bronze bushed wire rope	one - 6 x 1" - 1" bore
Machine bolts	3/8" x 5"	one
Machine bolts	3/8" x 1"	two
Flat washers	1"	two
Lock washers	3/8"	three
Cotter pins	1/4" x 2"	two

Counter balance - sheet 4

Side members	40	3" - 4.1 lb. channel	two - 54 inches
End member	41	"	one - 48 "
Cross member	42	"	one - 47-3/8 "
Cross brace	43	3/8" x 1-1/2" flat	two - 68 "
Stiffener	44	"	two - 19 "
Barrel stop	45	"	two - 19 "
Eye, cable	46	1/2" round	three - 10 "
Eye, drum chain	47	"	two - 6 "
Eye bolt & wing nut		1/2" x 6"	two
Chain grab hook		5/16"	two
Drum chain	48	1/4" log chain	two - 60 inches
Steel drum	49	55 gallon	one
Machine bolts		1/2" x 1-1/2"	two
Flat washers		1/2"	four

Part name and number	Material	Amount required
Lock washers	1/2"	two
Handle sides	58 2" x 1" x 3/16" channel	two - 34 inches
Handle - V	59 1" ex. hvy. pipe	one - 60 "
Handle cross member	60 1-1/4" ex. hvy. pipe	one - 36 "
Straight blade	53 3/8" x 5" spring steel	one - 36 "
Toothed blade	54 3/8" x 8" med. carb. steel	one - 36 "
Haulback clip	56 1/2" x 2" flat	one - 2 "
Haulback clip	(56) 3/8" x 1-1/2" flat	one - 5-1/2 "
Scraper step	57 1/4" x 1-1/4" flat	two - 18-1/2 "
Scraper teeth	55 1-1/4" x 2" auto carbon steel	four - 6-1/2 "
Machine bolts	1/2" x 1"	ten
No. 1 head plow bolts	3/8" x 1-3/4"	eight
Oval head soft steel rivets	1/2" x 1"	two
Oval head soft steel rivets	3/8" x 1-1/4"	four
Oval head soft steel rivets	3/8" x 1"	seven
Single block (steel)	61 3" x 3/4" sheave	one
Swivel shackles (steel)	62 1/2"	three
Scraper hitch chain	64 5/16" log chain	two - 48 inches
Standard side cleaning scraper body (No. 2 crescent)	Mfd. by Slusser-McLean Co., Sidney, Ohio 63	one
Lock washers	1/2"	ten

Attachment anchorage - sheet 7

Part name and number		Material	Amount required	
Frame insert	70	Channel iron	two	a
Frame insert fillet	(70)	1/4" flat	six	a
Frame insert extension	(70)	"	two	a
Axle block	73	Oak	two	a
Axle block U-bolt	76	1/2" round	two	a
Diagonal tie rods	74	"	three	a
Frame clamp bolts	75	"	two	a
Tie rod hook bolts	77	3/8" round	three	a
Tie rod straps	73	3/8" x 1-1/2" flat	three	a
Clamp bolt straps	(73)	"	two	a
Machine bolts		3/8" x 2-1/2"	eight	
Machine bolts		3/8" x 1"	eight	
U.S.S. nuts		1/2"	fourteen	
U.S.S. nuts		3/8"	three	
Pipe spacers		1/2" pipe	three - 1" long	
Lock washers		3/8"	nineteen	
Lock washers		1/2"	fourteen	

(a) Depends on make of truck.

General

Boom transport bracket (truck)	71	4" channel	two - 12 inches
Boom transport bracket (front)	72	2" x 2" x 1/4" angle	one - (a)
Boom cable (right primary)	35a	3/8" diam. 6 x 19 strand wire rope	one - 29-1/2 feet
Boom cable (left primary)	85b	"	one - 28 feet

Part name and number	Material	Amount required
Boom cable (secondary)	86 3/8" diam. 6 x 19 strand wire rope	two - 17 feet
Counterbalance cable (right)	87a 3/8" diam. 6 x 19 strand wire rope	one - 11 feet
Counterbalance cable (left)	87b "	one - 9-1/2 feet
Scraper return cable	66 "	one - 65 "
Scraper pull cable	65 1/2" diam. 6 x 19 strand wire rope	one - 35 "
Galvanized turnbuckle with locknuts	For #85b	one - 5/8 inch
Galvanized turnbuckle with locknuts	For #86	two - 1/2 "
Galvanized turnbuckle with locknuts	For #87b	one - 1/2 "
Wire rope shackles (steel)	For #85a & 85b, and 86 (lower end)	two - 5/8 "
Wire rope shackles (steel)	For #86 (upper end)	two - 1/2 "
Wire rope shackles (steel)	For #87a & 87b (upper end)	two - 1/2 "
Galvanized wire rope clips		34 - 3/8 "
Galvanized wire rope clips		2 - 1/2 "
Galvanized wire rope thimbles		13 - 3/8 "
Galvanized wire rope thimbles		1 - 1/2 "
Boom foot bolts	90 Steel-castellated nut	two - 1" by 4-1/2"
Counterbalance hinge bolts	91 "	two - 1" by 2"
Machine bolts	3/8" x 2-1/2"	nine
Machine bolts	3/8" x 1"	three
Lock washers	3/8"	twelve
Cotter pins	(90 & 91) 3/16" x 2"	four
Hoist unit - double drum, with 14 to 20 h.p. gasoline engine -		one

